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(FILE 'HOME' ENTERED AT 08:56:54 ON 19 APR 2007)  
FILE 'CA' ENTERED AT 08:57:02 ON 19 APR 2007  
L1 42267 S SER OR SERS OR SURFACE (1A) ENHANC? (2A) RAMAN  
L2 79 S L1 AND ADATOM  
L3 1061 S L1 AND (POTENTIAL OR VOLTAGE OR CURRENT OR PHASE) (3A) (CYCL? OR MODULAT? OR REVERS?)  
L4 82 S L3 AND (RAMAN OR ELECTRODE OR MICROELECTRODE)  
L5 200 S L1 AND ELECTRODEPOSIT?  
L6 61 S L5 AND (CYCL? OR MODULAT? OR REVERS?)  
E LAZARENKO/AU  
L7 12 S E66-75  
E NEKRASOV/AU  
L8 110 S E151, E156  
E BRIK Y/AU  
L9 4 S E3-4  
E LAGUTENKO O/AU  
L10 3 S E4  
L11 2 S L1 AND L7-10  
L12 5 S L1 AND (POLARIZER OR POLARISER)  
L13 28 S L1 AND POLARI?(5A) (OPTIC? OR FILTER?)  
L14 23 S L1 AND POLARI?(5A) (CYCL? OR MODULAT? OR REVERS? OR ROTA?)  
L15 61 S L1 AND POLARI?(5A) (LIGHT OR ILLUMINAT? OR RADIAT?)  
L16 318 S L2, L4, L6, L11-15  
L17 234 S L16 AND PY<2004  
L18 11 S L16 NOT L17 AND PATENT/DT  
FILE 'BIOSIS' ENTERED AT 09:31:43 ON 19 APR 2007  
L19 15 S L17  
FILE 'MEDLINE' ENTERED AT 09:32:18 ON 19 APR 2007  
L20 17 S L17  
FILE 'CA, BIOSIS, MEDLINE' ENTERED AT 09:33:07 ON 19 APR 2007  
L21 253 DUP REM L17 L18 L19 L20 (24 DUPLICATES REMOVED)

=> d bib,ab 121 1-253

L21 ANSWER 9 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 142:366358 CA  
TI Method and apparatus for detection and quantitation of impurities in electrolytic solutions  
IN **Lazarenko-Manevich, Rem M.; Nekrasov, Victor V.; Brik, Yevgeny B.; Lazarenko-Manevich, Vladimir R.; Fetisov, Igor V.; Lagutenko, Oleg**  
PA Organotek Defense System Corp., USA  
SO U.S. Pat. Appl. Publ., 8 pp.  
Mine  
PI US 2005079630 A1 20050414 US 2003-681264 20031009  
PRAI US 2003-681264 20031009  
AB Analytes are detected and/or quantified in electrolytic solns. using **Surface Enhanced Raman** Scattering spectroscopy (**SERS**) by adsorbing the analyte on the surface of an active metal electrode placed into an electrolytic soln. being analyzed and which provide periodic regeneration or **modulation** of surface concn. of **SERS**-active sites. As this occurs, the ambiguity of the measured values of the analyte signal, which is caused by instability of the surface activity of the

sensor, is eliminated by optically normalizing to the total **SERS** signal detd. by active metal **adatoms**.

L21 ANSWER 10 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 142:381154 CA  
TI Method for preparing surface for obtaining **surface-enhanced Raman** scattering spectra of organic compounds  
IN **Lazarenko-Manevich, Rem M.; Nekrasov, Victor V.; Brik, Yevgeny B.; Lazarenko-Manevich, Vladimir R.; Fetisov, Igor V.; Lagutenko, Oleg**  
PA Organotek Defense System Corporation, USA  
SO U.S. Pat. Appl. Publ., 5 pp.  
Edna Wong  
PI US 2005077184 A1 20050414 US 2003-681263 20031009  
PRAI US 2003-681263 20031009  
AB A **surface-enhanced Raman** scattering surface is prep'd. by anodizing an aluminum or aluminum alloy substrate with **reversed polarity current** to form pores of anodized oxide on the substrate, and **electrodepositing** silver or copper into the pores of the anodic oxide film to form needle-shaped metal particles in the pores of the anodic oxide film.  
Also see 10/681262 Yelena Gakh

L21 ANSWER 26 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 139:139913 CA  
TI The orientation of 2,2'-bipyridine adsorbed at a **SERS**-active Au(111) **electrode** surface  
AU Brolo, A. G.; Jiang, Z.; Irish, D. E.  
CS Department of Chemistry, University of Victoria, Victoria, BC, 3065, Can.  
SO Journal of Electroanalytical Chemistry (2003), 547(2), 163-172  
AB **Surface-enhanced Raman** scattering (**SERS**) spectra from 2,2'-bipyridine (22BPY) adsorbed on a **SERS**-active Au(111) **electrode** at several applied potentials were obtained. The **SERS**-active Au(111) surface was prep'd. following an electrochem. cleaning procedure. This procedure involves the application of continuous oxidn.-redn. **cycles** (orcs) within a **potential** region where no significant surface structural changes are expected to occur. The adsorbed 22BPY may assume several conformations, including the cis- and trans-configurations. Normal **Raman** spectra of aq. 22BPY at several different acidities are presented. These spectra are compared to the **Raman** features of both the free 22BPY and its Zn complex in the solid state. The normal **Raman** expts. showed that unique spectral characteristics were distinguishable for both the cis- and trans-configurations. Based on these results, the potential-dependent orientation (conformation) of 22BPY adsorbed on a **SERS**-active Au(111) was established. The **SERS** results suggested that, at a pos.-charged surface, 22BPY adsorbs end-on, using both nitrogens (cis-configuration). Although no strong spectroscopic evidence suggesting potential-induced reorientation was found, the pyridine rings may no longer be coplanar at the neg.-charged surface. However, the mols. keep the upright position with both nitrogens pointing towards the surface even in these neg. limits.

L21 ANSWER 39 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 137:207821 CA

TI Influence of lateral interactions on Raman scattering by molecules adsorbed on a solid surface: a model study  
AU Bortchagovsky, Eugene G.; Lozovski, Valeri Z.  
CS Institute of Semiconductor Physics, National Academy of Sciences of Ukraine, Kiev, 03022, Ukraine  
SO Surface Science (2002), 513(1), 57-70  
AB Theor. description and numerical modeling results are presented of processes like Raman scattering by mol. layers obtained with account of lateral interactions in such layers. Green functions for a half-space with an ultra-thin film is obtained from a self-consistent Dyson equation. Expression for the response of such a system on shifted frequency, which has straightforward phys. interpretation, is given. Lateral interactions create new modes localized on the ultra-thin film and it is the interaction with these modes, which can enhance response of such a film in different processes. Numerical calcns. based on the presented theor. results exhibit the possibility to enhance Raman scattering by adsorbed mols. both for p- and s-polarized light. Detailed qual. anal. of these processes clearly demonstrates that enhancement may be reached just by interaction with discussed modes. Obtained enhancement is not giant for Raman scattering, but it is remarkable and can be reached for any light polarization and for bigger variety of systems than surface enhanced Raman scattering can.

L21 ANSWER 49 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 136:228445 CA  
TI In-situ Raman spectra of adenosine on silver electrode  
AU Yang, Hai-Feng; Shen, He-Bo; Zhang, Zong-Rang  
CS Coll. Life Environ., Shanghai Teachers' Univ., Shanghai, 200234, Peop. Rep. China  
SO Guangpu Shiyanshi (2001), 18(6), 719-723  
LA Chinese  
AB The adsorption behavior of adenosine on silver electrode under potential modulation was obsd. by in-situ surface enhanced Raman scattering technique. The spectra data depict a flat orientation of adenine moiety of adenosine on surface of silver electrode in the potential range of 0.4-0.2V.

L21 ANSWER 52 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 135:310105 CA  
TI In situ SERS spectroscopy of Ag-modified pyrolytic graphite in organic electrolytes  
AU Itoh, Takashi; Abe, Koji; Mohamedi, Mohamed; Nishizawa, Matsuhiko; Uchida, Isamu  
CS Department of Applied Chemistry, Graduate School of Engineering, Tohoku University, Sendai, 980-8579, Japan  
SO Journal of Solid State Electrochemistry (2001), 5(5), 328-333  
AB Surface enhanced Raman scattering (SERS) was applied to study the Li intercalation/deintercalation process at the interface of a pyrolytic graphite electrode with propylene and ethylene carbonate contg. org. solns. The authors have focused on the lattice vibration of the most outer graphite surface layer simultaneously with cyclic voltammetric measurements. In situ Raman spectroscopy performed in this way allowed the authors to det. the La value that describes the size of graphitic

microcrystallites along the a-axis. The La value decreases when the **electrode** is polarized to potentials between 0.02 and 1.0 V. This phenomenon can be correlated with the intercalation of Li ions into the graphene structure. According to the spectral change, the size of the graphitic microcrystallites shows **reversible** behavior with **potential cycling** at the surface of the **electrode**.

L21 ANSWER 53 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 136:109600 CA  
TI Localized plasmon enhanced **optical** response: harmonic generation and **polarization** effects  
AU Gadenne, Patrice; Berini, Bruno; Buil, Stephanie; Quelin, Xavier; Anceau, C.; Gresillon, S.; Ducourtieux, S.; Rivoal, Jean-Claude; Breit, M.; Bourdon, A.; Sarychev, A. K.; Shalaev, V. M.  
CS Laboratoire de magnetisme et d'Optique de Versailles, UMR 8634, Universite de Versailles Saint Quentin, Versailles, F-78035, Fr.  
SO Proceedings of SPIE-The International Society for Optical Engineering (2001), 4467(Complex Mediums II: Beyond Linear Isotropic Dielectrics), 288-296.  
AB It is now known that plasmon oscillations supported by nanostructured metal thin films of fractal morphol., can result in large local fields and strong enhancement of optical phenomena, for example Raman scattering. The localized plasmons, acting like nano-antennas, can conc. very large electromagnetic energy in nanometer- sized areas, hot spots, and provide particularly strong enhancement of optical responses, in a very broad spectral range. The authors' new exptl. results show up position dependence of the hot spots on the **polarization** state of the **light**. Also as expected from recent theor. predictions, on this kind of thin percolating films, there is a dramatic enhancement of the 2nd harmonic generation ( $2\omega$ ) out of the specular directions. This unusual diffuse SHG could be connected to possible chirality of the percolating metallic films, which is expected to manifest itself as change in the hot-spot distribution for the left and right circularly **polarized** incident **light**.

L21 ANSWER 74 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 130:273437 CA  
TI Contribution of the Charge Transfer Mechanism to the **Surface-Enhanced Raman** Scattering of the Binuclear Ion Complex  $[Fe_2(Bpe)(CN)_{10}]^{6-}$  Adsorbed on a Silver **Electrode** in Different Solvents  
AU Corio, Paola; Temperini, Marcia L. A.; Santos, Paulo S.; Rubim, Joel C.  
CS Instituto de Quimica, Universidade de Sao Paulo, Sao Paulo, 05599-970, Brazil  
SO Langmuir (1999), 15(7), 2500-2507  
AB A **SERS** (**surface-enhanced Raman** scattering) study of the binuclear ion complex  $[Fe_2BPE(CN)_{10}]^{6-}$  (BPE = trans-1,2-bis(4-pyridyl)ethylene) adsorbed on a Ag **electrode** in different solvents is presented. The cycle voltammogram of the complex, in the region of the FeII/FeIII redox process, shows 2 oxidn. and 2 redn. waves sep'd. by 0.15 V, indicating that the 2 Fe centers are electronically coupled via the bridging ligand. The **SERS** measurements showed that both **SERS** intensity and frequency position of the bridging ligand modes present strong dependence on the applied potential. Remarkable changes in the

structure of the ligand are obsd. for applied potentials more neg. than -1.0 V, where the complex is reduced. The C:C ethylenic inter ring stretching mode shifts from 1637 to 1555 cm<sup>-1</sup>, indicating a decrease in this bond order for the reduced mol. The chem. interaction of the complex with the Ag surface involves ≥1 CN ligands as evidenced by an upward frequency shift of the CN stretching mode in the adsorbed complex. Upon redn., the ν(CN) frequency shifts to lower energies, indicating that the electron transferred in the Faradaic process is delocalized over the complex. From the **SERS** excitation profiles and their dependence on the exciting radiation, 2 **potential modulated** photon assisted charge-transfer processes were characterized: an adsorbate to metal (HOMO(CN) → Ag) and a metal to adsorbate (Ag → LUMO (BPE)), responsible for the enhancement of the ν(CN) and BPE modes, resp. Resonance between the energy of the exciting radiation and the metal/adsorbate charge-transfer transitions is achieved at different applied potentials for different solvents, thus indicating that the position of the energy levels of the adsorbed complex relative to the Fermi level (EF) changes according to the chem. nature of the solvent and the solvent/adsorbate interaction. Energy diagrams showing the relative positions of the donor and acceptor states of the surface complex formed by the binuclear complex and the Ag **electrode** surface in different solvents also were proposed.

L21 ANSWER 82 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 129:142023 CA  
TI Contribution of the Herzberg-Teller Mechanism to the **Surface-Enhanced Raman** Scattering of Iron Phthalocyanine Adsorbed on a Silver **Electrode**  
AU Corio, Paola; Rubim, Joel C.; Aroca, Ricardo  
CS Instituto de Quimica, Universidade de Sao Paulo, Sao Paulo, 05599-970, Brazil  
SO Langmuir (**1998**), 14(15), 4162-4168  
AB The **SERS** (**surface-enhanced Raman** scattering) and SERRS (**surface-enhanced resonant Raman** scattering) spectra of Fe(II) phthalocyanine (FePc) adsorbed onto a Ag **electrode** were studied. The electrochem. SERRS showed that the redn. of FePc mol. is **reversible** at neg. **potentials** <- 1.0 V vs. Ag/AgCl. The **SERS** spectra obtained by excitation off resonance contain mainly a<sub>1g</sub> and a<sub>2g</sub> vibrational modes. The excitation profiles of these modes show a max. of **SERS** intensity that shifts to more pos. values as the laser energy is decreased. The authors discuss the results of the a<sub>2g</sub> modes as being enhanced by a **potential modulated** adsorbate to metal charge-transfer mechanism, in which two electronic states of the MPc are coupled by a Herzberg-Teller term. In this case the acceptor state is localized on the Ag-**SERS** active site and the MPc coupling electronic excited states are of A<sub>2u</sub> and A<sub>lu</sub> symmetry, resulting in the enhancement of a<sub>2g</sub> vibrational modes.

L21 ANSWER 85 OF 253 CA COPYRIGHT 2007 ACS on STN.  
AN 129:33907 CA  
TI Spectroelectrochemical investigations of the interaction of ethyl xanthate with copper, silver and gold: III. **SERS** of xanthate adsorbed on gold surfaces  
AU Woods, Ronald; Hope, Gregory A.; Brown, Glen M.  
CS Technology, Faculty of Science, Griffith University, Nathan Campus,

- SO Queensland, 4111, Australia  
Colloids and Surfaces, A: Physicochemical and Engineering Aspects  
**(1998)**, 137(1-3), 339-344
- AB **Raman** spectroscopy was applied to study the interaction of Et xanthate with Au surfaces. **SERS** spectra showed that xanthate was adsorbed on the Au surface at **potentials** below the **reversible** values for di-Et dixanthogen and Au Et xanthate formation. As found previously for Cu and Ag, the **SERS** spectra confirmed that Et xanthate retains its mol. integrity in the layer deposited at underpotentials. The stretching vibrations of the hydrocarbon groups in the xanthate mol. chemisorbed on Au were suppressed when **SERS** spectra were recorded in situ, analogous to the behavior at Ag and Cu surfaces. Differences between the **Raman** spectra for di-Et dixanthogen and Au Et xanthate were utilised to record **SERS** spectra from the chemisorbed layer in the presence of a significant coverage of dixanthogen.
- L21 ANSWER 86 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 129:101351 CA  
TI Spectroelectrochemical investigations of the interaction of ethyl xanthate with copper, silver and gold: II. **SERS** of xanthate adsorbed on silver and copper surfaces  
AU Woods, Ronald; Hope, Gregory A.; Brown, Glen M.  
CS Technology, Faculty of Science, Griffith University, Nathan Campus, Queensland, 4111, Australia  
SO Colloids and Surfaces, A: Physicochemical and Engineering Aspects  
**(1998)**, 137(1-3), 329-337
- AB **Raman** spectroscopy was applied to the study of the interaction of Et xanthate with Ag and Cu surfaces. **SERS** spectra recorded in situ and on emersed **electrodes** confirmed the conclusion of previous studies that Et xanthate is chemisorbed on these metals at **potentials** below the **reversible** value for the corresponding metal-metal Et xanthate couple without change in its mol. integrity. The stretching vibrations of the hydrocarbon groups in the xanthate mol. are suppressed when **SERS** spectra were recorded in situ, but the corresponding rocking and deformation vibrations were unaffected. The hydrocarbon stretching vibrations were strong in the spectra from emersed **electrodes**. The difference between the spectra from surfaces in the two environments is discussed in terms of absorption of the signal by the overlaying H<sub>2</sub>O layer and the hydrophobic nature of chemisorbed xanthate.
- L21 ANSWER 90 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 127:191912 CA  
TI Nondisturbing and Stable **SERS**-Active Substrates with Increased Contribution of Long-Range Component of Raman Enhancement Created by High-Temperature Annealing of Thick Metal Films  
AU Feofanov, Alexei; Ianoul, Anatoli; Kryukov, Evgeniy; Maskevich, Sergei; Vasiliuk, Gennady; Kivach, Leonid; Nabiev, Igor  
CS Optical Spectroscopy Division Shemyakin and Ovchinnikov Institute of Bioorganic Chemistry, Russian Academy of Sciences, Moscow, 117871, Russia  
SO Analytical Chemistry **(1997)**, 69(18), 3731-3740  
AB High-temp. annealing of thick silver films (TSFs) deposited onto a smooth dielec. substrate leads to high-order self-organization of metal

clusters on the film surface. A comparative at. force microscopic (AFM) anal. of "as-deposited" and annealed TSFs (aTSFs) shows that uniform ellipsoidal roughness  $\square 41 \times 25$  nm in lateral cross section and  $\square 45$  nm in height results after annealing. These metal clusters are mutually oriented so that the main lateral axes of the ellipsoids are nearly parallel. UV-visible data demonstrate a  $\square 300$  nm hypsochromic shift of the bands corresponding to the collective surface plasmon modes. Addnl., a new ( $\square 350$  nm) band related to the normal component of the plasmon oscillations appears after annealing. This band was found to be strongly angle-dependent for p-polarized light. The aTSFs appeared extremely time- and org. solvent-stable vs. as-deposited films. The aTSFs were found to be nondisturbing **surface-enhanced Raman** scattering (**SERS**)-active substrates in the application to studies of complexation of crown ether styryl dyes with metal ions. A pronounced **SERS** signal of the analyte rhodamine 6G was obsd. with aTSFs, even when the analyte was sepd. from the silver surface with five Langmuir-Blodgett monolayers of stearic acid. At the same time, depositing only a monolayer of stearic acid on the as-deposited film completely suppressed the **SERS** signal of the analyte. Finally, the self-assembling of Ag clusters on the surface of the aTSF, stimulated by the high-temp. annealing, results in the creation of a time- and org. solvent-stable **SERS** substrate with nanometer-scale quasi-periodical roughness, and this substrate exhibits an increased contribution of the electromagnetic component to the overall Raman enhancement. P P P.  
136195-70-5 136195-71-6.

L21 ANSWER 96 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 126:178297 CA

TI Potential-averaged **surface-enhanced Raman** spectroscopy

AU Tian, Z. Q.; Li, W. H.; Mao, B. W.; Zou, S. Z.; Gao, J. S.

CS State Key Lab. Physical Chem. Solid Surfaces, Xiamen Univ., Xiamen, 361005, Peop. Rep. China

SO Applied Spectroscopy (1996), 50(12), 1569-1577

AB Potential-averaged **surface-enhanced Raman** spectroscopy (PASERS) has several advantages over **SERS**. A PASERS spectrum is acquired when the **electrode** is rapidly **modulated** between 2 **potentials** by applying a square-wave voltage. The potential-averaged **SERS** spectrum contains all the information on the surface species at the 2 **modulated potentials**, and each individual **SERS** spectrum can then be extd. by deconvolution. By properly choosing the 2 **modulating potentials**, 1 can obtain **SERS** spectra of surface species at **electrode** potentials where **SERS**-active sites are normally unstable. PASERS leads to a unique way of studying complex interfacial kinetic processes by controlling the voltage pulse height, frequency, and shape. The measurement of time-resolved spectra in the very low vibrational frequency region can be achieved by PASERS using a conventional scanning spectrometer with a single-channel detector. The main advantages of PASERS are illustrated by studying 2 typical **SERS** systems, i.e., SCN- and thiourea adsorbed at Ag **electrodes**, resp. The potential-averaging method can be applied as a common method to many other existing spectroelectrochem. techniques.

L21 ANSWER 105 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 123:97596 CA

TI Influence of photochemical effects on irreversible loss of "active sites" on **SERS** active silver electrode  
AU Kudelski, A.; Bukowska, J.  
CS Dep. Chemistry, Univ. Warsaw, Warsaw, 02-093, Pol.  
SO Spectrochimica Acta, Part A: Molecular and Biomolecular Spectroscopy (1995), 51A(4), 573-8  
AB The intensity dependence of **surface-enhanced Raman** scattering (**SERS**) of pyridine adsorbed on the silver electrode at several excitation wavelengths is studied. It is found that **SERS** intensity decays faster if an electrode is illuminated by a green laser line than in the case of the red line. This difference of decay rate cannot be exclusively explained by the difference of electrode surface temps. The results show that on the surface of the silver electrode the photochem. process of irreversible incorporation of **adatoms** or **adatom** clusters into the electrode strongly sensitive to adsorbed anions takes place. We suggest that deactivation is a photochem. process caused by irreversible destruction of complexes of silver **adatoms** with anions.

L21 ANSWER 116 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 118:233342 CA

TI Application of **surface-enhanced Raman** spectroscopy to organic electrocatalytic systems: decomposition and electrooxidation of methanol and formic acid on gold and platinum-film **electrodes**

AU Zhang, Yun; Weaver, Michael J.

CS Dep. Chem., Purdue Univ., West Lafayette, IN, 47907-1393, USA

SO Langmuir (1993), 9(5), 1397-403

AB The nature of adsorbed species formed by decompn. of methanol and formic acid under voltammetric conditions on gold and platinum-coated gold **electrodes** in acidic and alk. media has been explored by **surface-enhanced Raman** spectroscopy (**SERS**). Sequences of **SER** spectra were recorded during **potential-sweep cycles** to correlate the **potential**-dependent surface speciation with reactant electrooxidn. and other voltammetric features. Despite the obsd. absence of methanol electrooxidn. on gold in perchloric acid, decompn. to yield adsorbed -CHO, -COH, and  $\eta_2$  (O,O) formate, as well as CO, was detected. In contrast to the apparent inability of these species to undergo electrooxidn. under such conditions, adsorbed CO formed from soln. CO is seen to undergo remarkably facile electrooxidn. on gold. The latter observation is apparently connected with the formation of CO bound to partially oxidized gold sites even at low potentials, as obsd. by **SERS**. Such reactive species are not formed by methanol decompn. Formic acid, however, readily undergoes electrooxidn. on gold in perchloric acid; adsorbed formate rather than CO is identified by **SERS** as the reaction intermediate. Methanol, but not formate, undergoes electrooxidn. in 0.1 M KOH; the former yields adsorbed CO extensively at higher concns. Despite facile electrooxidn. of methanol on the platinum films in acid, little adsorbed CO is discerned to be present from both **SERS** and surface IR spectroscopy. The former technique suggests instead the predominant formation of an acetylenic species. Some virtues and limitations of **SERS** for deducing the nature of adsorbed species in org. electrocatalytic processes are noted in the light of these findings.

L21 ANSWER 122 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 116:169373 CA  
TI **Surface-enhanced Raman** spectroscopy at a silver **electrode** as a real-time detector in flowing streams  
AU Pothier, Neil J.; Force, R. Ken  
CS Dep. Chem., Univ. Rhode Island, Kingston, RI, 02881, USA  
SO Applied Spectroscopy (1992), 46(1), 147-51  
AB An anal. application for **surface-enhanced Raman** spectroscopy (**SERS**) at a silver **electrode** is described. Real-time **SER** spectra of adenine and cytosine have been recorded in a 10- $\mu$ L spectroelectrochem. flow cell under flowing conditions. Charge-coupled-device detection allowed high-quality spectra spanning a  $\square$ 1200 cm<sup>-1</sup> region to be recorded with integration times of 4 s. A low-power He-Ne laser was used as a source. **SERS** at the silver **electrode** offers rapid time response to adsorption/desorption by appropriate **potential modulation**. The technique is extremely reproducible and insensitive to temp. and flow rate. The effects of incident photon energy and applied potential on the intensity of the **Raman** signal are discussed.

L21 ANSWER 130 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 114:129814 CA  
TI Direct comparison of the chemical properties of single crystal Ag(111) and electrochemically roughened Ag as substrates for surface Raman scattering

AU Byahut, S.; Furtak, T. E.  
CS Phys. Dep., Colorado Sch. Mines, Golden, CO, 80401, USA  
SO Langmuir (1991), 7(3), 508-13  
AB Surface plasmon assisted Raman scattering spectroscopy was used to characterize flat single crystal Ag under electrochem. control. By monitoring the vibrational modes of p-nitrosodimethylaniline (pNDMA), it is shown that a Ag(111) surface grown on a mica substrate is devoid of active sites that are responsible for the electronic component of enhancement in **SERS**. This surface was used as a ref. condition in a study of roughening by oxidn.-reduced cycles in chloride ion-contg. solns. Active sites, which are produced with  $\geq$ 1 monolayer of Ag restructuring, and which are assocd. with more intense Raman scattering from pNDMA, have a higher electron accepting character than sites on Ag (111). Direct evidence is given for the **adatoms** or small clusters being the active sites. The spectra obtained on a single crystal and electrochem. roughened surfaces are used to explain the role of the adsorbate excited-state stability in detg. the lineshape of the obsd. spectra.

L21 ANSWER 132 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 116:183436 CA  
TI Potential averaged **surface-enhanced Raman** spectroscopic thiocyanate adsorbed at silver **electrodes**  
AU Tian, Z. Q.; Lin, W. F.; Mao, B. W.  
CS Dep. Chem., Xiamen Univ., Xiamen, 361005, Peop. Rep. China  
SO Journal of Electroanalytical Chemistry and Interfacial Electrochemistry (1991), 319(1-2), 403-8  
AB The new potential method in **surface-enhanced Raman** spectroscopy with more rapid **potential modulation** was used to study the temporal adsorption-desorption phenomena. Only one **SERS** spectrum was recorded,

while 2 **potentials** of interest were **modulated**. The potential averaged **SERS** (PASERS) was employ to study the SCN- adsorption at Ag **electrodes**.

- L21 ANSWER 136 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 113:121422 CA  
TI Study of adatomic diffusion in **surface-enhanced Raman** scattering by photoacoustic method  
AU Jung, E. C.; Rhee, B. K.; Kim, Y. D.; Jung, C. S.  
CS Dep. Phys., Sogang Univ., Seoul, 100-611, S. Korea  
SO Solid State Communications (1990), 74(10), 1063-5  
AB The amplitude of the photoacoustic signal from Ag electrode was measured as a function of electrode potential for electrochem. **SERS** system. The amplitude change of photoacoustic signal arises from the change of adat. concn. on surface of electrode. The **SERS** intensity profile vs. electrode potential predicted by the charge-transfer theory fits with the exptl. curve very well in the non-Faradaic region where the amplitude of photoacoustic signal remains unchanged.
- L21 ANSWER 137 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 112:165811 CA  
TI Differential reflectance spectroscopy and **SERS** of mildly roughened silver **electrodes**  
AU Bryant, Mark A.; Pemberton, Jeanne E.  
CS Dep. Chem., Univ. Arizona, Tucson, AZ, 85721, USA  
SO Langmuir (1990), 6(4), 751-8  
AB Differential reflectance spectroscopy was used to measure the reflectivity of electrochem. roughened Ag **electrodes** in 0.1 M KCl and 0.1 M KCl/0.05 M pyridine. The **electrodes** were subjected to varying anodic current densities in double-**potential-step** oxidn.-redn. **cycles**. A correlation exists in both systems between **SERS** intensities for both  $\nu(\text{Ag}-\text{Cl})$  and pyridine ring breathing vibrations and the magnitude of the decrease in reflectivity. Surfaces that exhibit the greatest decrease in reflectivity exhibit the greatest **SERS** intensity. SEM was used to characterize surface morphol. The reflectivity spectra are interpreted in terms of absorption by large-scale Ag roughness features. The correlation between decrease in reflectivity and increased **SERS** intensity is proposed to be due to electromagnetic enhancement effects.
- L21 ANSWER 138 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 112:127618 CA  
TI In situ scanning tunneling microscopy observation of surface roughness of electrochemically modified silver under potentiostatic control in conjunction with **surface-enhanced Raman** scattering  
AU Sakamaki, K.; Itoh, K.; Fujishima, A.; Gohshi, Y.  
CS Fac. Eng., Univ. Tokyo, Tokyo, 113, Japan  
SO Journal of Vacuum Science & Technology, A: Vacuum, Surfaces, and Films (1990), 8(1), 525-9  
AB A morphol. transformation of Ag electrode in 0.1 mol dm<sup>-3</sup> KCl has been studied by in situ STM observation by controlling the electrode potential during a single electrochem. oxidn.-redn. cycle (ORC) treatment in conjunction with **SERS**. Prior to the oxidn. the Ag electrode surface has ellipsoidal structures. After the single oxidn.

treatment electrochem. formation of AgCl clusters and **adatoms** occurred at the edge of ellipsoidal structures. These species were stripped by the redn. processes. A single ORC treated Ag surface has roughness on an at. scale due to the presence of residual AgCl clusters, **adatoms**, and adsorbed chloride ions. The ORC treated surface has roughness characteristics more suitable for observing the **SERS** effect than the electrochem. untreated surface.

L21 ANSWER 144 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 111:64946 CA

TI The surface reaction of sulfur dioxide with adsorbed nitrate ion on silver metal microstructures: a **surface enhanced Raman** scattering experiment

AU Bates, Jennifer L.; Dorain, Paul B.

CS Chem. Dep., Amherst Coll., Amherst, MA, 01002, USA

SO Journal of Chemical Physics (1989), 90(12), 7478-81

AB **Surface enhanced Raman** scattering (**SERS**) was used in conjunction with mass spectrometry to study the in situ replacement reaction of adsorbed NO<sub>3</sub><sup>-</sup> on Ag metal powder with SO<sub>2</sub> gas to form adsorbed SO<sub>3</sub>2<sup>-</sup> and SO<sub>4</sub>2<sup>-</sup> and gaseous NO<sub>2</sub>. Anal. of the intensity changes of the obsd. peaks lead to a model for surface reaction at low coverage. The time-dependent background intensity, proportional to the **adatom** concn. which changes during the chem. reaction, is used to normalize the **SERS** peak intensities. The resulting spectrum is proportional to the time-dependent coverage and, if the reaction heat is small, the time-independent electromagnetic enhancement. Examples are given demonstrating this effect.

L21 ANSWER 145 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 110:221257 CA

TI Binding of alkynes to silver, gold, and underpotential deposited silver **electrodes** as deduced by **surface-enhanced Raman** spectroscopy

AU Feilchenfeld, Hannah; Weaver, Michael J.

CS Dep. Chem., Purdue Univ., West Lafayette, IN, 47907, USA

SO Journal of Physical Chemistry (1989), 93(10), 4276-82

AB **Surface-enhanced Raman** (**SER**) spectra of C<sub>2</sub>H<sub>2</sub> and simple alkynes adsorbed on Ag, Au and Au covered with a monolayer of underpotential deposited Ag were detd. in electrochem. systems at room temp. Multiple bands were obsd. in the triple bond region (1900-2200 cm<sup>-1</sup>), in addn. to a feature at 1800 cm<sup>-1</sup> and an intense peak at 1500-1600 cm<sup>-1</sup>. No ≡C-H stretching vibrations were detected. The spectra on Au and Ag-coated-Au **electrodes** are essentially potential independent. The intensities of the bands obtained on Ag, stronger than on the other metals, exhibit clear and **reversible potential**-related changes. In particular, the 1800-cm<sup>-1</sup> band decreases and the 1550-cm<sup>-1</sup> band increases at neg. potentials. The ν(C≡C) frequencies of different alkynes on the same metal surface are almost identical, suggesting the formation of similar metal-adsorbate bonding for all compds. The spectra in the triple bond region closely resemble the vibrational spectra of bulk-phase metal-alkyne complexes. They were therefore assigned to on alkyne-metal complexes formed on the surface, in which the triple bond lies flat on the metal. The resemblance between the **SER** frequencies on Ag and on Au is due to the similar electronic configuration of the two metals. In

contrast, the more electron-deficient Ag-covered-Au surface exhibits higher  $\nu(C\equiv C)$  frequencies. The 1550-cm<sup>-1</sup> band is assigned to sp<sup>2</sup> rehybridized forms of the adsorbates. The strongly downshifted 1800-cm<sup>-1</sup> band, present on Ag at pos. potentials, may be due to the presence of polarized or ionic mol. species, stabilized by the electropos. surface.

L21 ANSWER 152 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 110:239407 CA  
TI Force constants and bond polarizabilities of thiocyanate ion adsorbed on the silver electrode as interpreted from the **surface enhanced Raman** scattering  
AU Huang, Yi; Wu, Guozhen  
CS Inst. Chem., Acad. Sin., Beijing, Peop. Rep. China  
SO Spectrochimica Acta, Part A: Molecular and Biomolecular Spectroscopy (1989), 45A(2), 123-8  
AB The **SERS** of the SCN was studied in 2 ways. First, normal mode anal. was used to det. the force consts. of the adsorbed SCN. The force const. for the C-N bond becomes larger while that for the S-C bond smaller in the adsorbed state. The **adatom** model with an effective Ag mass of 0.1 mAg (mAg being the mass of the Ag) was adequate for the anal. The Ag **adatom** was bound to the bulk electrode surface. The adsorption is phys. Second, the **SERS** intensities were analyzed to obtain the mol. polarizability derivs. The polarizability deriv. of the C-N stretching motion was most responsive to the applied voltage. The polarizability deriv. of the S-C stretching motion was smaller than that of the C-N bond as compd. in the soln. This conclusion was attributed to the adsorption center at the S. Generally mol. polarizability derivs. are functions of the frequencies of the exciting lasers and the applied voltages on the electrode.

L21 ANSWER 154 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 110:102536 CA  
TI **Surface-enhanced Raman** scattering applied to surface chemical kinetics  
AU Dorain, P. B.  
CS Dep. Chem., Amherst Coll., Amherst, MA, USA  
SO Report (1988), TR-7; Order No. AD-A191275, 11 pp. Avail.: NTIS From: Gov. Rep. Announce. Index (U. S.) 1988, 88(15), Abstr. No. 838,215  
AB The applications of **surface-enhanced Raman** scattering (**SERS**) to study surface chem. reaction kinetics is presently limited because the enhancement mechanisms are reaction dependent. The size and the no. d. of the surface roughness is dependent on the reaction parameters, such as  $\Delta H$  and temp. that are functions of time. For selected reactions, a partial soln. exists if during the course of the reaction, surface reconstruction is confined to modification of the **adatom** structures. Electromagnetic enhancement, due to surface roughness of  $\square 20$  nm, is nearly const. in this case, and only the **adatom** enhancement mechanism is time dependent. The **adatom** concn. is also proportional to the background intensity due to electron-hole recombination in the metal substrate. Thus the **adatom** time dependence of the **SERS** spectra may be removed by normalization to the background in a spectral region without discrete **SERS** peaks. Applications to the decompr. of allynes(sic), phosphonates, and NO<sub>2</sub> on Ag powders provide supportive evidence.

- L21 ANSWER 157 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 109:160189 CA  
TI Preparation of gold **electrodes** for **surface enhanced Raman** spectroscopy  
**SERS**  
AU Holze, Rudolf  
CS Fachber. Chem., Univ. Oldenburg, Oldenburg, D-2900, Fed. Rep. Ger.  
SO Surface Science (1988), 202(3), L612-L620  
AB An electrochem. method for prepn. of **electrodes** for **SERS** involving repetitive dissoln.-deposition **potential cycling** of a polycryst., smooth Au **electrode** is described, which can be applied in both halide-free and halide contg. solns. The **SERS**-active **electrodes** obtained this way can be cleaned effectively and subsequently exposed to electrolyte solns. contg. adsorbable mols. No trapping of mols. or ions present during the activation is found in **SERS**, the signal-to-noise ratio obtained with these **electrodes** even allows detection of weakly adsorbed species.
- L21 ANSWER 160 OF 253** CA COPYRIGHT 2007 ACS on STN  
AN 110:74729 CA  
TI Reactions of ethyne and propyne on silver powder  
AU Dorain, Paul B.; Boggio, Joseph E.  
CS Amherst Coll., Amherst, MA, 01002, USA  
SO Materials Research Society Symposium Proceedings (1988), 111 (Microstruct. Prop. Catal.), 207-12  
AB Ag powder is activated by pulsing it with NO<sub>2</sub> gas which forms fresh Ag microclusters. This powder is then exposed to subsequent pulses of C<sub>2</sub>H<sub>2</sub> or CH<sub>3</sub>C<sub>2</sub>H (3.7% in N<sub>2</sub>). The **surface enhanced Raman** scattering spectra (**SERS**) show dramatic intensity variations due to rapid changes in **adatom** concn. Normalization of these time-dependent **SERS** spectra to the background scattering intensity, which is proportional to the **adatom** concn., provides spectra which represent adsorbate coverage if major surface reconstruction does not occur. The temporal development of the **SERS** spectra of C<sub>2</sub>H<sub>2</sub> shows rapid degrdn. with no evidence for adsorbed species. In contrast, propyne reacts more slowly, as evidenced by the behavior of the intensity at 1980 cm<sup>-1</sup> due to adsorbed -C<sub>2</sub>-. The reactions obsd. are in accord with the models developed by Barreau et al. (1985). Exposure to both alkynes results in the appearance of **SERS**-active NO, an adsorbent not previously obsd. at room temp. Ellipsometric measurements are consistent with the presence of a carbon overlayer, which may stabilize the NO and render the system inert to further chem. reaction.
- L21 ANSWER 163 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 106:220656 CA  
TI Enhanced Raman scattering with one monolayer of silver  
AU Miragliotta, J.; Furtak, T. E.  
CS Dep. Phys., Colorado Sch. Mines, Golden, CO, 80401, USA  
SO Physical Review B: Condensed Matter and Materials Physics (1987), 35 (14), 7382-91  
AB **Adatoms**, clusters, and complexes have been assocd. with the active sites that enable the short-range mechanism of **surface-enhanced Raman** scattering (**SERS**). To clarify this relationship the interaction

between pyridine and a monolayer (ML) of Ag on a Pt substrate was studied as a function of applied potential and soln. compn. The electromagnetic calcns. show only small optical fields exist at the 1-ML Ag-Pt substrate surface which are incapable of supporting the electromagnetic enhancement of **SERS**. This confirms the authors' earlier report that enhancement for this system arises from an electronic resonant Raman process in the surface complex. The growth of the Ag ML was performed in a thin-layer soln.-exchange electrochem. cell. The cell allowed removal of the Ag<sup>+</sup> soln. and introduction of a pyridine and Cl<sup>-</sup> soln. while maintaining a const. applied potential. No **SERS** exists for pyridine absorbed on the pre-prepd. Ag ML. Electrochem. oxidn. and redn. of the ML in the presence of pyridine and Cl<sup>-</sup> is necessary before a signal is obsd. This process creates Cl<sup>-</sup> stabilized, electron-deficient sites onto which pyridine is bound. These Ag<sup>+</sup> sites on the Pt substrate are analogous to the Ag<sup>4+</sup> pyramidal clusters which have been discovered as **SERS**-active sites on bulk Ag substrates.

L21 ANSWER 168 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 108:222030 CA  
TI **Surface-enhanced Raman** scattering of adenine, adenosine and ATP molecules  
AU Chen, T. T.; Liang, N. T.; Huang, H. J.; Chou, Y. C.  
CS Dep. Phys., Natl. Tsing Hua Univ., Hsin Chu, 30043, Taiwan  
SO Chinese Journal of Physics (Taipei, Taiwan) (**1987**), 25(1), 205-14  
AB The **surface-enhanced Raman** scattering (**SERS**) of adenine, adenosine and ATP mols. adsorbed on Ag electrodes were studied. The compds. all have similar **SERS** spectra, the same voltage dependence and the same concn. dependence. This can be understood if these mols. are adsorbed on the Ag electrodes through the adenine rings with end-on or flat-on orientations. The **SERS** signals for these mols. increase steadily on the consecutive oxidn.-redn. cycles between -0.3 and 0.2 Vsce. This can be understood by use of the **adatom** model of the **SERS**.

L21 ANSWER 171 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 108:12964 CA  
TI Reexamination of adatomic effects in electrochemical **SERS** systems  
AU Ha, Dong Han; Lee, Sun Koo; Kim, Jong Jean  
CS Phys. Dep., Korea Adv. Inst. Sci. Technol., Seoul, S. Korea  
SO Chemical Physics Letters (**1987**), 141(1-2), 104-7  
AB The potential dependence of **SERS** intensities during the oxidn.-redn. process was reexamd. in the inelastic background (at 510 cm<sup>-1</sup>), the Ag<sup>0</sup>-Cl peak and the pyridine band for the pyridine/KCl/H<sub>2</sub>O/Ag electrode system. Qual. differences in temporal evolution of the intensities were obsd. for the above 3 bands near the completion of the redn. process, which could be explained in terms of the adat. model.

L21 **ANSWER 175 OF 253** CA COPYRIGHT 2007 ACS on STN  
AN 106:74866 CA  
TI **Surface enhanced Raman** scattering of pyridine on silver **electrodes** formed with controlled-rate oxidation-reduction cycles  
AU Cross, Nathan A.; Pemberton, Jeanne E.  
CS Dep. Chem., Univ. Arizona, Tucson, AZ, 85721, USA

SO Journal of Electroanalytical Chemistry and Interfacial Electrochemistry  
**(1987)**, 217(1), 93-100

AB A study was made in which the **SERS** intensity of the pyridine ring breathing vibration at 1008 cm<sup>-1</sup> at Ag **electrodes** was found to be dependent upon both the large scale and at. scale roughness of the **electrode** surface. The controlled surface morphol. was generated by a double **potential** step oxidn.-redn. **cycle** ORC technique. SEM of these surfaces reveals varying large scale surface morphologies that are dependent upon ORC rate. A correlation between **SERS** intensity and large scale surface morphol. was interpreted in terms of significant contributions from electromagnetic effects in electrochem. **SERS**. The correlation between **SERS** intensity and this surface morphol. is independent of the presence of at. scale roughness. The results confirm and extend the results of previous investigations of the morphol. of **SERS**-active surfaces.

L21 **ANSWER 179 OF 253** CA COPYRIGHT 2007 ACS on STN

AN 106:95070 CA

TI **Polarization modulation** infrared spectroscopic measurements of thiocyanate and cyanide at the silver electrode/aqueous electrolyte interface by means of Kretschmann's ATR prism configuration

AU Hatta, A.; Sasaki, Y.; Suetaka, W.

CS Fac. Eng., Tohoku Univ., Sendai, 980, Japan

SO Journal of Electroanalytical Chemistry and Interfacial Electrochemistry  
**(1986)**, 215(1-2), 93-102

AB A new technique of **polarization modulation** IR spectroscopy using Kretschmann's ATR prism configuration was applied to the in-situ observation of SCN<sup>-</sup> and CN<sup>-</sup> at the Ag electrode/aq. electrolyte interfaces. The feasibility of this technique was demonstrated for selective detection of SCN<sup>-</sup> and CN<sup>-</sup> adsorbates at the interface without substantial hindrance from absorption of the species in soln. The changes obsd. in the CN stretching bands of the two adsorbates upon changing the electrode potential are described and compared with the existing **surface-enhanced Raman** scattering and IR reflection absorption spectroscopic data.

L21 ANSWER 181 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 102:211854 CA

TI Resonant enhancement of the electric field in the grooves of bare metallic gratings exposed to **S-polarized light**

AU Wirgin, A.; Maradudin, A. A.

CS Lab. Mec. Theor., Univ. Paris VI, Paris, F-75230/05, Fr.

SO Physical Review B: Condensed Matter and Materials Physics **(1985)**, 31 (8), 5573-6

AB Cavity resonances are produced for **S-polarized light** striking an infinitely conducting lamellar grating. They manifest themselves by significant elec. field enhancements within the grooves. This result has applications to **surface-enhanced Raman** scattering.

L21 **ANSWER 184 OF 253** CA COPYRIGHT 2007 ACS on STN

AN 102:140015 CA

TI "**Adatom**" sites, structure and mobility effects on the **SERS** of cyanine

AU Gu, Ben; Akins, D. L.  
CS City Coll., City Univ. New York, New York, NY, 10031, USA  
SO Chemical Physics Letters (1985), 113(6), 558-62  
AB The origins of sp. **surface-enhanced Raman** scattering (**SERS**) bands of 2,2'-cyanine in an electrochem. system using 488 nm excitation are discussed. Under special conditions of concn. and potential, using KI as supporting electrolyte, bands can be grouped according to their potential dependency. Exptl. evidence shows that several cyanine bands are attributable to aggregated mols. Some cyanine bands depend on the presence of different sites that can be enhanced by exposure to pulsed laser radiation; the temporal behavior of some bands indicates that different surface mobilities exist for some of the mols.

L21 **ANSWER 185 OF 253** CA COPYRIGHT 2007 ACS on STN

AN 103:112062 CA  
TI Evidence for the formation of a cationic surface layer on silver, copper and gold under **potential cycling** conditions: a possible interpretation of the electromagnetic field effect involved in **SERS** phenomena  
AU Burke, L. D.; Casey, M. I.; Cunnane, V. J.; Murphy, O. J.; Twomey, T. A. M.  
CS Chem. Dep., Univ. Coll. Cork, Cork, Ire.  
SO Journal of Electroanalytical Chemistry and Interfacial Electrochemistry (1985), 189(2), 353-62  
AB An alternative view was sought as to the origin of the high elec. field, i.e. polarization effects, at the Ag/soln. interface, e.g. in **surface enhanced Raman** spectroscopy (**SERS**). Typical voltammograms are given for Ag in aq. phosphate and in aq. borate buffers and in 1.0 mol/dm<sup>3</sup> NaOH, and an interpretation is given. Preliminary data are also given for voltammetry of Ag in aq. pyridine solns. The presence of pyridine has little effect on the voltammetric response of Ag in the lower region of the pos. sweep. Differences between the Ag/pyridine and most other transition metal systems under repetitive **potential cycling** are summarized and discussed. Similar studies were made on Cu and Au.

L21 **ANSWER 187 OF 253** CA COPYRIGHT 2007 ACS on STN

AN 102:53215 CA  
TI Gold as a ubiquitous substrate for intense **surface-enhanced Raman** scattering  
AU Gao, Ping; Patterson, Mary L.; Tadayyon, M. A.; Weaver, Michael J.  
CS Dep. Chem., Purdue Univ., West Lafayette, IN, 47907, USA  
SO Langmuir (1985), 1(1), 173-6  
AB A straightforward procedure based on **potential** sweep oxidn.-redn. **cycles** is reported by which mildly roughened Au surfaces can be prep'd. that yield intense and stable **surface-enhanced Raman** spectra for a wide variety of adsorbates at the Au-aq. interface. Representative spectra are reported for halides, pseudohalides, and oxyanions featuring adsorbate-surface vibrations, for redox-active metal complexes including outer-sphere as well as surface-attached adsorbates, and for adsorbed C<sub>2</sub>H<sub>4</sub>.

L21 **ANSWER 188 OF 253** CA COPYRIGHT 2007 ACS on STN

AN 102:86774 CA  
TI The **Raman** spectroscopy of the ferricyanide/ferrocyanide system at gold,

AU       $\beta$ -palladium hydride and platinum **electrodes**  
AU      Fleischmann, M.; Graves, P. R.; Robinson, J.  
CS      Dep. Chem., Univ. Southampton, SO9 5NH, UK  
SO      Journal of Electroanalytical Chemistry and Interfacial Electrochemistry  
          (1985), 182(1), 87-98  
AB      The **surface enhanced Raman** spectroscopy (**SERS**) of ferricyanide and ferrocyanide anions at Au **electrodes** shows that both species are adsorbed at the interface. The variation of the spectra with potential and the nature of the cations of the support electrolyte shows that anions and cations are coadsorbed and that the structure of the anions is markedly perturbed compared to that of the soln. phase species. **SERS** of these ions at Pd **electrodes** can be readily generated by converting the surface to the  $\beta$ -palladium hydride. In this case, the spectra are more simple, but both anions are again adsorbed. Adsorption is also shown to take place at smooth Pt **electrodes**, measurements in this case being carried out by **potential modulated** surface unenhanced **Raman** spectroscopy (**SUERS**), but with resonance **Raman** enhancement of the scattering. The spectroscopic results show that electron transfer in the ferrocyanide/ferricyanide system cannot be considered to be a purely outer sphere reaction. Results indicate that the smallest change in structure of the adsorbed species takes place in supporting electrolytes contg. Cs ions; these solns. give the largest value of the std. rate const. for the reaction.

L21     **ANSWER 189 OF 253** CA   COPYRIGHT 2007 ACS on STN  
AN      102:102657 CA  
TI      Enhanced and normal **Raman** scattering from pyridine adsorbed on rough and smooth silver **electrodes**  
AU      Fleischmann, M.; Graves, P. R.; Robinson, J.  
CS      Dep. Chem., Univ. Southampton, Southampton, SO9 5NH, UK  
SO      Journal of Electroanalytical Chemistry and Interfacial Electrochemistry  
          (1985), 182(1), 73-85  
AB      A multiplex spectrograph was used to record p.d. and modulation **Raman** spectra of pyridine (I) adsorbed on Ag **electrodes** in an electrochem. cell. Spectra were obtained from rough Ag surfaces which give **surface-enhanced Raman** scattering (**SERS**) and from surfaces where **SERS** was diminished by prolonged cathodic polarization (**DSERS**). **Raman** scattering from I at smooth Ag surfaces in KCLO<sub>4</sub> and KF solns. was distinguished from soln. scatter by a **potential modulation** technique. The enhanced scattering caused by Ag atom or cluster sites is representative of the surface as a whole as similar **Raman** spectra are obtained on smooth surfaces at a count rate as low as 01.4 photons-s<sup>-1</sup> (incident laser power 500 mW). Correlation of simultaneous differential capacitance data and snapshot **SERS** spectra indicate that I mols. in aq. chloride ion solns. adsorb on Ag in a flat  $\pi$ -bonded configuration at potentials markedly pos. to the point of zero charge and exhibit specific reorientations at -0.3 V and -0.45 V (vs. SCE) to become N-bonded, perpendicular to the surface. The adsorption behavior of I in chloride and fluoride ion solns. is largely similar.

L21     **ANSWER 191 OF 253** CA   COPYRIGHT 2007 ACS on STN  
AN      101:218801 CA

TI **Surface-enhanced Raman** spectroscopy of Rhodamine 6G adsorbed on colloidal silver  
AU Hildebrandt, Peter; Stockburger, Manfred  
CS Abt. Spektrosk., Max-Planck-Inst. Biophys. Chem., Goettingen, D-3400, Fed. Rep. Ger.  
SO Journal of Physical Chemistry (1984), 88(24), 5935-44  
AB **Surface-enhanced Raman** scattering (SERRS) of Rhodamine 6G (R6G) adsorbed on colloidal Ag was studied. Adsorption isotherms could be obtained from SERRS and fluorescent measurements. Two different kinds of adsorption sites were inferred from the isotherms. One kind is rather unspecific and shows a high surface coverage. The enhancement factor at such sites is 3000, which can be well explained by the classical electromagnetic theory of colloids. The 2nd kind is only obsd. in the presence of anions (Cl-, I-, Br-, F-, SO<sub>4</sub><sup>2-</sup>). Specific active sites are formed at an extremely low surface coverage. From the isotherms at such sites the mols. are chemisorbed. Overall enhancement factors up to 106 were found for mols. at anion-activated sites. The addnl. enhancement factor is ascribed to a local mechanism of an R6G-**adatom** (or cluster)-anion surface complex. SERRS excitation profiles of active sites are closely related to the mol. resonance at 530 nm. SERRS spectra of R6G were recorded and analyzed in a wide frequency range. The 2 adsorption sites could be distinguished by characteristic vibrational features. It was demonstrated that SERRS is also a powerful anal. tool for dye mols.

L21 **ANSWER 192 OF 253** CA COPYRIGHT 2007 ACS on STN

AN 101:160423 CA

TI **Surface-enhanced Raman** scattering and second-harmonic generation from cyanide ion complexes and sulfate ion on silver **electrodes** during oxidation-reduction cycles

AU Chen, T. T.; Von Raben, K. U.; Murphy, D. V.; Chang, R. K.; Laube, B. L.  
CS Sect. Appl. Phys., Yale Univ., New Haven, CT, 06520, USA  
SO Surface Science (1984), 143(2-3), 369-90

AB The temporal evolution of the **surface-enhanced Raman** scattering (**SERS**) from SO<sub>4</sub><sup>2-</sup> and CN- complexes adsorbed on a Ag **electrode** immersed in 0.1 M K<sub>2</sub>SO<sub>4</sub> + 0.01 M KCN electrolytes during an electrochem. oxidn.-redn. cycle (ORC) was investigated. The appearance and the disappearance of the high-frequency stretching modes of SO<sub>4</sub><sup>2-</sup> and CN- complexes, as well as the low-frequency stretching and bending modes of Ag-SO<sub>4</sub> and Ag-C-N were correlated with cyclic voltammograms recorded during an ORC. Similar correlations were made between the cyclic voltammogram and the increase and decrease of the surface-enhanced diffused 2nd-harmonic generation (SHG) from the electrochem. roughened Ag surface itself, from the adherent layer of Ag<sub>2</sub>SO<sub>4</sub> and AgCN, and from the CN- complexes adsorbed on the Ag **electrode** surface. Diffused SHG from Ag **electrodes** was investigated in the following electrolytes: (1) 0.1 M K<sub>2</sub>SO<sub>4</sub>, (2) 0.1 M K<sub>2</sub>SO<sub>4</sub> + 0.01 M KCN, (3) 0.1 M K<sub>2</sub>SO<sub>4</sub> + 0.01 M NaOH, and (4) 0.1 M K<sub>2</sub>SO<sub>4</sub> + 0.01 M NaOH + 0.01 M KCN. The latter 2 electrolytes were selected to illustrate the importance of Ag<sub>2</sub>O in decreasing the diffused SHG signal when the Ag **electrode**, immersed in an electrolyte of pH > 7, is **cycled** through a specific **potential** region that involves the formation of Ag<sub>2</sub>O. Differences between the potential-dependent evolution of the **SERS** and SHG signals are postulated.

L21 ANSWER 193 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 100:74599 CA

TI **Surface-enhanced Raman** spectroscopy of electrochemically characterized interfaces. Relations between **Raman** scattering intensity and surface coverage for simple anionic adsorbates

AU Weaver, Micheal J.; Hupp, Joseph T.; Barz, Felix; Gordon, Joseph G., II; Philpott, Michael R.

CS Dep. Chem., Purdue Univ., West Lafayette, IN, 47907, USA

SO Journal of Electroanalytical Chemistry and Interfacial Electrochemistry (1984), 160(1-2), 321-33

AB **Surface-enhanced Raman** scattering (**SERS**) obtained as a function of **electrode** potential for Cl-, Br-, I-, SCN-, N3-, and CN- adsorbed at roughened Ag **electrodes** is compared with corresponding surface concn.-potential data extd. from differential capacitance measurements to examine the relation between **SERS** and surface coverage for these structurally simple adsorbates. After generating **SERS** by means of an oxidn.-redn. cycle, it was found that altering the potential to a more neg. value, where the adsorbate coverage fell below a monolayer, corresponded closely in most cases to the onset of a potential-dependent decay in the **SERS** intensity. Monitoring the potential dependence of the **Raman** intensity with an optical multichannel analyzer as well as with a conventional scanning spectrometer allowed a rapid **reversible** component of the **potential** dependence to be sep'd. from an addnl. irreversible signal decay assocd. with the loss of **Raman**-active sites. Examn. of potential-dependent **SERS** sufficiently rapidly so that reversible conditions prevail has the crucial advantage of holding const. the concn. of **Raman**-active sites. For adsorbed Cl- and Br-, an approx. correlation was found between the fractional coverage and the variation in the corresponding reversible **Raman** intensity brought about by altering the **electrode** potential. The present results suggest that the adsorption energetics of the **Raman**-active surface sites do not differ substantially from those for the sites occupied by the majority of the adsorbate.

L21 ANSWER 197 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 100:111360 CA

TI Increased **enhancement** in **surface enhanced Raman** scattering from silver electrodes with the addition of pyridine to the electrolyte

AU Owen, J. F.; Chang, R. K.

CS Cent. Laser Diagn., Yale Univ., New Haven, CT, 06520, USA

SO Chemical Physics Letters (1984), 104(1), 59-64

AB The addn. of pyridine to a 1M KCl electrolyte before the oxidn.-redn. cycle (ORC) of a Ag electrode significantly increases the **surface enhanced Raman** scattering (**SERS**) intensities of the H<sub>2</sub>O and AgO-Cl- stretching modes. The increase in the enhancement can be attributed to the fact that AgO **adatoms**, formed during the ORC, are stabilized by adsorbed pyridine complexes. The addn. of pyridine after the ORC does not affect the H<sub>2</sub>O and AgO-Cl- **SERS** intensities.

L21 ANSWER 204 OF 253 CA COPYRIGHT 2007 ACS on STN

AN 99:148323 CA

TI SERS of water, pyridine and halides adsorbed on silver **electrodes** during electrochemical cycling  
AU Owen, J. F.; Chen, T. T.; Chang, R. K.; Laube, B. L.  
CS Sect. Appl. Phys., Yale Univ., New Haven, CT, 06520, USA  
SO Journal of Electroanalytical Chemistry and Interfacial Electrochemistry (1983), 150(1-2), 389-98  
AB Recent investigations in this lab. on **surface enhanced Raman** scattering (**SERS**) from H<sub>2</sub>O, AgO-X-, and pyridine species adsorbed on Ag **electrodes** in 1M KX (X = Cl, Br, I, and F) electrolytes are discussed. Use of an optical multichannel analyzer has allowed simultaneous monitoring of the **SERS** peaks over a 1200 cm<sup>-1</sup> range as the **electrode potential** is continuously **cycled** through the oxidn.-redn. cycle (ORC) or is repeatedly cycled in a nonfaradaic region of the ORC. Laser-induced changes in the **SERS** intensities, **electrode** surface morphologies, and cyclic voltammograms are noted. The results indicate potential dependent competition among the adsorbates for sites on the Ag surface. The voltage dependence of the irreversible loss in the enhancement factor provides evidence for the role of **adatoms** in the **SERS** enhancement mechanism.

L21 ANSWER 207 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 98:98157 CA

TI The influence of temperature on **surface enhanced Raman** scattering in the electrochemical environment: evidence for **adatoms**  
AU Macomber, S. H.; Furtak, T. E.  
CS Dep. Phys., Rensselaer Polytech. Inst., Troy, NY, 12181, USA  
SO Solid State Communications (1983), 45(3), 267-71  
AB The **surface enhanced Raman** signal from the Cl- surface stretch vibration on Ag in aq. KCl is irreversibly quenched by thermal dissocn. of Ag-**adatom**-Cl- surface complexes. In a KF electrolyte, where a low concn. of Ag<sup>+</sup> ions is present, temp. changes alter the steady state **adatom** concn. and give rise to reversible changes in the inelastic continuum background Raman signal.

L21 ANSWER 208 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 99:148840 CA

TI Irreversible loss of **adatoms** on silver **electrodes** during **potential cycling** determined from **surface enhanced Raman** intensities  
AU Owen, J. F.; Chen, T. T.; Chang, R. K.; Laube, B. L.  
CS Sect. Appl. Phys., Yale Univ., New Haven, CT, 06520, USA  
SO Surface Science (1983), 131(1), 195-220  
AB **Surface enhanced Raman** scattering (**SERS**) of adsorbates (AgO-Cl-, H<sub>2</sub>O and pyridine) on Ag **electrodes** in 1M KCl and 1M KCl + 0.05M pyridine electrolytes was monitored continuously with an optical multichannel analyzer system as the **electrode potential** was **cycled** over various ranges within nonfaradaic regions of the oxidn.-redn. cycle. A systematic investigation was performed of the potential dependence of **SERS** of pyridine in 1M KX + 0.05M pyridine electrolytes, where X = F, Cl, Br and I. Since the surface coverage of the adsorbates is **reversible** with **potential cycling** within a **potential** range, it was possible to det. potential dependences of the irreversible loss in the **SERS** enhancement factor which occurs as the **electrode** potential is

ramped toward the potential of zero charge (PZC). The results provide strong support for the role of **adatoms** on the **electrode** surface in the overall enhancement mechanism. There is evidence that this strongly bound adsorbates immobilize the **adatoms** at pos. potentials but allow the **adatoms** to migrate and become lost at surface defects as the potential approaches the PZC where the adsorbates are less tightly bound.

L21 ANSWER 214 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 97:62858 CA  
TI Electrochemical properties of small clusters of metal atoms and their role in the **surface enhanced Raman** scattering  
AU Plieth, W. J.  
CS Lawrence Berkeley Lab., Univ. California, Berkeley, CA, 94720, USA  
SO Journal of Physical Chemistry (1982), 86(16), 3166-70  
AB Starting with equations for the shift of the **reversible redox potential** of small metal particles with size, the electrochem. properties of these particles are discussed. Approx. equations are given for the relation between the particle size and the surface charge, the potential of zero charge, the surface potential, work function and quantities related to this function. The influence of these properties on redox reactions, electrosorption, and chemisorption are discussed. The results are used to explain exptl. observation in connection with the **surface-enhanced Raman** effect.

L21 ANSWER 227 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 95:88383 CA  
TI **Surface enhanced Raman** scattering from pyridine, water, and halide ions on gold, silver, and copper electrodes  
AU Pettinger, Bruno; Wetzel, Herbert  
CS Fritz-Haber-Inst., Max-Planck-Ges., Berlin, 1000/33, Fed. Rep. Ger.  
SO Berichte der Bunsen-Gesellschaft (1981), 85(6), 473-81  
AB The enhancement of Raman scattering for pyridine mols. on Au, Ag, and Cu and for water and halide ions on Ag and Cu electrodes was investigated. An enhancement was found only in that spectral region where relative undamped surface plasmon polaritons (SPP) can be excited, showing a general increase for long wavelength excitation. The electrochem. pretreatment of the metal surfaces, consisting in an oxidn./redn. cycle creates large scale roughness and **adatom**-adsorbate complexes, both of which are necessary simultaneously in order to obtain intense **SER** scattering. It is inferred that the enhancement results from high d. of SPP quanta created at rough or particularly shaped metal surfaces and the SPP scattering cross section being significant larger than that of photons.

L21 ANSWER 243 OF 253 CA COPYRIGHT 2007 ACS on STN  
AN 94:38970 CA  
TI Surface-enhanced light scattering from silver **electrodes**: background and cyanide stretch vibration  
AU Timper, J.; Billmann, J.; Otto, A.; Pockrand, I.  
CS Phys. Inst. III, Univ. Duesseldorf, Duesseldorf, D-4000/1, Fed. Rep. Ger.  
SO Surface Science (1980), 101(1-3), 348-54

AB The dependence is reported on the background signal and the stretch vibration signal of cyanide adsorbed at a Ag **electrode** on the amt. of reduced charge in the anodic **cycle**, on **potential**, and on time. The results are discussed with respect to proposed enhancement mechanisms, esp. within the resonant **Raman** model, involving at. scale surface roughness.

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